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Applicant	:	SEMMLINGER et al.
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Hon. Commissioner of Patents
and Trademarks
Washington, D.C. 20231

SUPPLEMENTAL APPEAL BRIEF

(1) REAL PARTY IN INTEREST.

The real party in interest is KUKA Systems GmbH.

(2) RELATED APPEALS AND INTERFERENCES.

There are believed to be no related appeals and interferences.

(3) STATUS OF CLAIMS.

Claims 1-5, 7, 9-19 and 21 are on appeal.

Claims 6, 8 and 20 have been canceled.

Claims 1-5, 7, 9-11, 13-19 and 21 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Takagi et al. (U.S. 3,954,215) in view of Farley et al. (U.S. 3,542,383).

Claim 12 stands rejected under 35 U.S.C. 103(a) as being unpatentable over Takagi et al. in view of Farley et al., and further in view of Deemie et al. (U.S. 3,439,853).

(4) STATUS OF AMENDMENTS.

The After Final Amendment filed December 11, 2008 has been entered for purposes of appeal as noted in the Advisory Action of December 23, 2008.

(5) SUMMARY OF THE CLAIMED SUBJECT MATTER

CLAIM 1:

The present invention relates to a friction welding machine 1 (page 5, lines 10-12; Figures 1 and 2). The friction welding machine 1 comprises a frame 2 (page 5, lines 13-14; Figures 1 and 2) and a first headstock 5 (page 5, line 14 through page 6, line 2; Figures 1-4). The first headstock 5 has a first spindle 8 (page 5, line 14 through page 6, line 2; Figures 1-3) with a first workpiece holder 22 (page 5, line 14 through page 6, line 2; Figures 1-4) and with a spindle drive 12 (page 5, line 14 through page 6, line 2; Figures 1 and 2). The friction welding machine 1 also comprises a feed drive 25 (page 6, lines 7-8; Figures 1 and 2) with a second workpiece holder 22 (Figures 1 and 2). The friction welding machine 1 comprises a second headstock 6 (page 6, lines 3-5; Figures 1-4) with a second spindle 9 (page 6, lines 3-5; Figures 1-4), with a spindle drive 13 (page 6, lines 3-5; Figures 1 and 2) and with the second

workpiece holder 22 (page 6, lines 3-5; Figures 1-3). The second headstock 6 is mounted axially movably at the frame 2 (page 6, lines 6-7; Figures 1 and 2). The second headstock 6 is connected to the feed drive 25 (page 6, lines 7-8; Figures 1 and 2). At least one of the first workpiece holder 22 and the second workpiece holder 22 has a bridge 10, 11 (page 9, lines 5-8; Figures 2-4). The bridge 10, 11 receives a torque M and a forge force F during friction welding such that at least one of the first spindle 8 and the second spindle 9 does not receive the forge force F and the torque M produced via the friction welding (page 9, lines 5-8; Figure 4). The bridge 10, 11 has a carrying body 33 (page 10, lines 17-18; Figure 4) and a positive-locking support 34 for connection to at least one of the first headstock 5 and the second headstock 6 (page 10, line 18 through page 11, line 2; Figure 4). The bridge is critical to the invention since it advantageously prevents one of the first spindle 8 and the second spindle 9 from receiving the forces produced during friction welding. This advantageously increases the service life of at least one of the spindles since the spindle is not subjected to the intense forces produced by the friction welding. The bridge also allows for the spindles to be rotated in opposite directions so that the speed of rotation acting at the site of friction can be significantly greater than that of conventional techniques.

CLAIM 2:

The first headstock 5 may be arranged stationarily at the frame 2 (page 5, line 14 through page 6, line 2; Figure 1).

CLAIM 3:

The spindles 8, 9 may have different sizes (page 3, lines 4-6; page 6, lines 16-18; page 7, line 19 through page 8, line 1; page 8, lines 8-10; page 8, lines 12-14; page 9, lines 11-12; page 9, lines 15-17; Figures 1 and 2).

CLAIM 4:

The spindle 9 of the second spindle drive 13 may be smaller than the other spindle 8 (page 3, lines 4-6; page 6, lines 9-12; Figures 1 and 2).

CLAIM 5:

The second spindle drive 13 may be weaker than the first spindle drive 12 (page 6, lines 9-11 page 12, lines 5-7).

CLAIM 7:

A workpiece holder 22 may be mounted rigidly at the bridge 10, 11 (page 10, lines 17-18).

CLAIM 9:

The positive-locking connection 34 may have pins 35 and openings 36 that engage each other at the carrying body 33 and at least one of the first headstock 5 and the second headstock 6 (page 11, lines 1-2; Figure 4).

CLAIM 10:

At least one workpiece holder 22 may be detachably connected to a spindle 8, 9 (page 11, lines 7–9; Figure 4).

CLAIM 11:

The spindles 8, 9 and the bridge 10, 11 may have similar workpiece holders 22 (page 11, lines 17-18; Figures 1 and 2).

CLAIM 12:

The second headstock 6 may have a traveling carriage 7 (page 6, lines 6-7; Figures 1 and 2). The traveling carriage 7 may be mounted and guided in a positive-locking manner at a carriage guide 31 at the frame 2 along a direction of feed 32 (page 7, lines 1-3; Figures 1 and 2).

CLAIM 13:

The feed drive 25 may be mounted and supported at a column 4 of the frame 2 (page 7, lines 4-5; Figures 1 and 2).

CLAIM 14:

The column 4 and the stationary headstock 5 may be connected by one or more tie rods

29 (page 7, lines 15-17; Figure 2).

CLAIM 15:

The feed drive 25 may have one or more cylinders 26, 28 (page 7, lines 10-12; Figure 2).

CLAIM 16:

The spindle drives 12, 13 may have electric drive motors 14, 15 (page 7, line 19 through page 8, line 3; Figures 1 and 2).

CLAIM 17:

At least one spindle drive 12, 13 may have settable flywheel masses 17, 18 (page 8, lines 8-14; Figure 2).

CLAIM 18:

The stationary spindle drive 8 may have one or more additional flywheel masses 17, 18 that can be coupled (page 8, lines 12 through page 9, line 4; Figure 2).

CLAIM 19:

Claim 19 relates to a process for operating a friction welding machine 1 (page 5, lines 10-12; Figures 1 and 2). Applicant has discovered the problem that conventional processes for

operating a friction welding machine produce extremely high forging forces and torque. The spindles are disadvantageously subjected to these high forging forces and torque. This significantly reduces the service life of the spindles. Applicant has solved this problem by providing a process for operating a friction welding machine that includes a bridge 10, 11 (page 9, lines 5-8; Figures 2-4) that relieves the spindles from such intense forces during friction welding. This significantly increases the service life of the spindles since the intense forces are not constantly exerted on the spindles.

The process of operating the friction welding machine 1 comprises providing the welding machine 1 with a plurality of headstocks 5, 6 with spindles 8, 9, spindle drives 12, 13 and workpiece mounts 22 (page 5, line 14 through page 6, line 5; Figures 1 and 2). One of the headstocks 5, 6 is movably mounted to provide a movably mounted headstock 6 (page 6, lines 6-8; Figures 1 and 2). A feed drive 25 is provided for moving the movably mounted headstock 6 (page 6, lines 7-8; page 7, lines 4-8; Figures 1 and 2). The bridge 10, 11 is connected to one of the headstocks 5, 6 (page 9, lines 5-8; Figure 2-4). One of the spindles 8, 9 is relieved of axial forge and welding forces F and torque M with the bridge 10, 11 during a welding operation (page 9, lines 5-8; Figure 4). The workpiece mount 22 is removed from the spindle 8, 9 that is to be relieved (page 11, lines 8-9), and the bridge 10, 11 with the workpiece mount 22 attached thereto is placed over the spindle 8, 9 and connected to the headstock 5, 6 by means of a support 34 (page 11, lines 7-16; Figure 4).

CLAIM 21:

Claim 21 is directed toward a friction welding machine 1 (page 5, lines 10-12; Figures 1 and 2). The friction welding machine 1 includes a bridge 10, 11 (page 9, lines 5-8; Figures 2-4). The bridge 10, 11 is a critical feature of the present invention because it prevents extremely intense forces, which are produced during frictional welding, from being exerted on the spindles 8, 9 (page 5, line 14 through page 6, line 1; page 6, lines 3-5). This significantly increases the service life of the spindles 8, 9 and provides for a more reliable welding machine 1.

The welding machine 1 comprises a frame 2 (page 5, lines 13-14; Figures 1 and 2) and a first headstock 5 (page 5, line 14 through page 6, line 1; Figures 1 and 2). The first headstock 5 has a first spindle 8 with a first workpiece holder 22 and a first spindle drive 12 (page 5, line 14 through page 6, line 1). The first spindle drive 12 is mounted on the first headstock 5 (Figures 1 and 2). The welding machine 1 further comprises a feed drive 25 with a second workpiece holder 22 (page 6, lines 7-8; Figures 1 and 2). A portion of the feed drive 25 is in contact with the frame 2 (Figures 1 and 2). The welding machine 1 comprises a second headstock 6 having a second spindle drive 13 mounted thereto and a second spindle 9 (page 6, lines 3-5; Figures 1 and 2). The feed drive 25 extends through the second headstock 6 such that the second workpiece holder 22 is located on one side of the second headstock 6 (Figures 1 and 2). The second headstock 6 is mounted for movement such that the second headstock 6 is movable in an axial direction on the frame 2 (page 6, lines 6-7; Figures 1 and 2). At least one of the first workpiece holder 22 and the second workpiece holder 22 has the bridge 10, 11

connected thereto (page 9, lines 5-8; Figures 2 and 3). The bridge 10, 11 receives a torque M and a forge force F during friction welding such that at least one of the first spindle 8 and the second spindle 9 does not receive the forge force F and the torque M produced via the friction welding (page 9, lines 5-8; Figure 4).

(6) GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL.

Whether claims 1-5, 7, 9-11, 13-19 and 21 are rejectable under 35 U.S.C. 103(a) as being unpatentable over Takagi et al. (U.S. 3,954,215) in view of Farley et al. (U.S. 3,542,383).

Whether claim 12 is rejectable under 35 U.S.C. 103(a) as being unpatentable over Takagi et al. in view of Farley et al., and further in view of Deemie et al. (U.S. 3,439,853).

(7) ARGUMENT.

ISSUE: Whether claims 1-5, 7, 9-11, 13-19 and 21 are rejectable under 35 U.S.C. 103(a) as being unpatentable over Takagi et al. (U.S. 3,954,215) in view of Farley et al. (U.S. 3,542,383).

CLAIM 1

The present invention relates to a friction welding machine that comprises a first headstock and a second headstock. The first headstock has a first spindle with a first workpiece holder and a spindle drive. The friction welding machine includes a feed drive with a second workpiece holder. The second headstock is connected to the feed drive. The second

headstock with a second spindle, another spindle drive and the second workpiece holder is mounted for movement on a frame such that the second headstock is movable in an axial direction. At least one of the first workpiece holder and the second workpiece holder has a bridge. The bridge advantageously relieves one of the first spindle and the second spindle of the torque and the forge force that are created during friction welding. This advantageously increases the service life of at least one of the spindles since the spindle is not subjected to the intense forces produced by the friction welding. The bridge also allows for the spindles to be rotated in opposite directions so that the speed of rotation acting at the site of friction can be significantly greater than that of conventional techniques. The prior art as a whole fails to disclose such features or such advantages.

The final rejection admits that Takagi et al. fails to disclose at least one of the workpiece holders having a bridge as claimed and relies on Farley et al. to teach at least one workpiece holder having a bridge such that one of the workpieces does not receive a forge force and a torque produced by friction welding.

Farley et al. discloses a chuck assembly 12 that includes a chuck body 31 that is secured by capscrews 32 to a spindle nose 33 which is mounted upon a spindle 17 by capscrews 35. A drive key 34 is secured to the spindle nose 33 and interlocks with the chuck body 31 to insure rotation of the chuck assembly with the spindle. The chuck assembly includes an outer chuck 36 and an inner chuck 37 which are supported within the chuck body 31 in spaced apart concentric relation to receive a workpiece WP-1. In operation during a weld cycle, the workpiece WP-1 is inserted into the chuck assembly between the outer chuck 36 and the inner

chuck 37. A chucking cylinder rod 51 is retracted. The mandrel 44 is accordingly urged further into the chuck assembly by an actuator bolt 46 and causes expansion of the inner chuck sleeve 37. During this operation, the spring 59 is compressed between the mandrel 44 and the washer 61 as it comes in contact with the inner chuck 37. As the inner chuck sleeve 37 makes contact with the workpiece WP-1, axial force applied by the clamping cylinder is transferred through the inner sleeve to the actuator block 40. The actuator block 40 is then also moved leftwardly and draws the outer chuck sleeve 36 further into the chuck body 31. The interaction of tapered surface 38 and 39 causes the outer chuck sleeve 36 to be restricted or collapsed upon the workpiece WP-1 so that the workpiece is secured in place during the entire welding operation by a constant force applied through the chucking cylinder. As the workpieces WP-1 and WP-2 are brought into axial engagement during the welding portion of the cycle, the workpiece WP-1 and the chuck assembly 12 are rotating together with the spindle 17. Axial thrust applied by the workpiece WP-2 against the workpiece WP-1 is transferred to the backup plate 52 and then into the actuator block 40. Since the outer chuck sleeve 36 is secured to the actuator block 40, the additional force that is applied collapses the outer sleeve 36 upon the workpiece and exerts still greater clamping force upon the workpiece WP-1.

Farley et al. fails to teach and fails to suggest the combination of at least one workpiece holder having a bridge wherein the bridge receives a torque and a forge force during friction welding such that at least one of a first spindle and a second spindle does not receive the forge force and the torque produced via the friction welding. The final rejection takes the position that the backup plate 52 and the actuator block 40 of Farley et al. absorb the torque and the

upsetting force during friction welding. Appellant respectfully disagrees with this interpretation of Farley et al. Farley et al. discloses a chuck assembly 12 that is connected to a spindle 17, which is driven, and a tailstock chuck 13 that is non-rotatable. Farley et al. clearly discloses an arrangement with only one spindle 17 wherein the spindle 17 would inevitably absorb the torques that occur during friction welding since there is no connection between the chuck assembly 12 and the housing of the friction welding machine 11 as shown in Figure 1. In fact, Column 2, lines 1-11 of Farley et al. disclose that the chuck assembly 12 has a chuck body 31, which is screwed to a spindle nose 33, and the spindle nose 33 is mounted on the spindle 17. As such, torque is transmitted to the spindle 17 of Farley et al. during welding by the chuck body 31 being connected to the spindle nose 33 via drive key 34. Compared with Farley et al., the bridge of at least one workpiece holder of the present invention receives torque that is produced during friction welding such that at least one spindle does not receive the torque created from the welding. This significantly increases the service life of the spindle and advantageously allows the workpiece holders to be rotated in opposite directions so that the speed of rotation at the site of friction between the two workpieces is dramatically increased. Farley et al. fails to disclose such advantages since Farley et al. does not teach or suggest a structure that receives torque such that the torque is not transmitted to at least one spindle during friction welding as claimed.

Farley et al. fails to provide any teaching or suggestion for the combination of a bridge that receives a forge force such that the forge force is not transmitted to at least one spindle during friction welding. Farley et al. discloses that the workpiece WP-1 is held by an inner

chuck 37 on the inside and by an outer chuck 36 on the outside such that the workpiece WP-1 is clamped between the inner chuck 37 and the outer chuck 36. The inner chuck 37 of Farley et al. is clamped by a mandrel 44 with the action of a chucking cylinder rod 51. However, the outer chuck 36 is additionally clamped during friction welding by the upsetting force introduced by the workpiece WP-1. Even though the workpiece WP-1 is supported at a backup plate 52 and acts on the actuator block 40, the chucking cylinder rod 51, the backup plate 52 and the actuator block 40 are pushed to the left by the upsetting force during friction welding. This disadvantageously transmits a force to the spindle 17 of Farley et al. and does not lead to a relief of the spindle 17 since the outer chuck 36 is supported via the keyway against the chuck body 31 so that upsetting forces act on the chuck body 31, which allows the forces to be transmitted to the spindle 17 since the chuck body 31 is fastened to the spindle 17. As such, a person of ordinary skill in the art would understand that the axial upsetting forces in Farley et al. would be transmitted to the spindle 17 since the chuck assembly 12 as a whole is fastened to the spindle 17 and has no other support such that the axial upsetting forces as well as the torques are absorbed by the spindle 17 and the spindle mount 18 only.

The references as a whole fail to provide any teaching or suggestion for the combination of a bridge having a carrying body and a positive-locking support for connection to at least one of a first headstock and a second headstock. The final rejection takes the position that capscrews 32, 35 of Farley et al. are the equivalent of the positive-locking support of the present invention. Appellant disagrees with this interpretation of Farley et al. The capscrews 32, 35 do not provide a positive-locking support connecting between a bridge and

at least one headstock as claimed. Capscrews 32, 35 of Farley et al. do not provide any positive-locking features as recited and cannot be considered a support as claimed. As such, the prior art as a whole fails to establish a prima facie case of obviousness since the prior art references as whole do not teach or suggest important features of the present invention. Claim 1 is not obvious in view of the teachings of Takagi et al. and Farley et al. Accordingly, it is requested that the Examiner's rejection be reversed.

CLAIM 2

Takagi et al. and Farley et al. fail to teach or suggest a bridge that relieves at least one spindle of forge forces and torque produced during friction welding. The device of Farley et al. clearly transmits forces to spindle 17 since the chuck body 31 is connected to the spindle nose 33 via drive key 34 . Claim 2 is not obvious in view of Takagi et al. and Farley et al. Accordingly, it is requested that the Examiner's rejection be reversed.

CLAIM 3

Takagi et al. fails to teach and fails to suggest the combination including a bridge that prevents one or more spindles from receiving forge forces and torque produced during friction welding wherein the spindles are of different sizes. The final rejection relies on Column 5, line 60 of Takagi et al. to disclose spindles of different sizes. Appellant respectfully disagrees with this interpretation of Takagi et al. Takagi et al. must be given a fair reading for what it teaches and suggests. Column 5, lines 55-61 of Takagi et al. discloses that welding energies can be

freely adjusted by selectively controlling the disconnecting time of a main spindle system, which time is determined from the welding conditions such as materials and sizes of workpieces. However, Column 5, lines 55-61 of Takagi et al. is completely void of any mention that spindles may be of different sizes. In fact, Figure 1 of Takagi et al. clearly shows that the spindles 9 and 24 are of the same size and are of not different sizes as claimed. As such, the prior art as a whole takes a different approach and fails to establish a prima facie case of obviousness. Claim 3 is not obvious in view of Takagi et al. and Farley et al. Accordingly, it is requested that the Examiner's rejection be reversed.

CLAIM 4

The references as a whole fail to establish a prima facie case of obviousness as the cited references do not teach or suggest important features of the claimed combination. Takagi et al. fails to teach and fails to suggest the combination including a bridge that prevents one or more spindles from receiving forge forces and torque produced during friction welding wherein a spindle of a second spindle drive is smaller than another spindle. The final rejection relies on Column 5, line 60 of Takagi et al. to disclose spindles of different sizes. Appellant respectfully disagrees with this interpretation of Takagi et al. Column 5, lines 55-61 of Takagi et al. only discloses that disconnecting time of a main spindle system is determined from the welding conditions such as materials and sizes of workpieces. However, Column 5, lines 55-61 of Takagi et al. is completely void of any mention of one spindle being smaller than another spindle. In fact, Figure 1 of Takagi et al. clearly shows that the spindles 9 and 24 are of the

same size and not different sizes as claimed. As such, the prior art as a whole takes a different approach and fails to provide any teaching or suggestion for important features of the claimed combination. Claim 4 is not obvious in view of Takagi et al. and Farley et al. Accordingly, it is requested that the Examiner's rejection be reversed.

CLAIM 5

Takagi et al. and Farley et al. fail to teach or suggest a bridge that relieves at least one spindle of forge forces and torque produced during friction welding in combination with a second spindle drive that is weaker than a first spindle drive. The device of Farley et al. clearly transmits forces to spindle 17 since the chuck body 31 is connected to the spindle nose 33 via drive key 34 . It is inevitable that forces are transmitted to the spindle 17 of Farley et al. As such, claim 5 is not obvious in view of Takagi et al. and Farley et al. Accordingly, it is requested that the Examiner's rejection be reversed.

CLAIM 7

The references as a whole fail to teach or suggest the combination including a workpiece holder that is mounted rigidly at a bridge. The final rejection takes the position that Farley et al. discloses a workpiece holder that is mounted rigidly at a bridge. Farley et al. fails to disclose a bridge as featured in the present invention. Even though the workpiece WP-1 of Farley et al. is supported at a backup plate 52 and acts on the actuator block 40, the chucking cylinder rod 51, the backup plate 52 and the actuator block 40 are pushed to the left by the

upsetting force during friction welding. This disadvantageously transmits a force to the spindle 17 of Farley et al. and does not lead to a relief of the spindle 17 since the outer chuck 36 is supported via the keyway against the chuck body 31 so that upsetting forces act on the chuck body 31, which allows the forces to be transmitted to the spindle 17 since the chuck body 31 is fastened to the spindle 17. The bridge is a critical feature of the present invention since it prevents forge forces and torque from being exerted on at least one of the spindles. This advantageously provides the spindles of the present invention with a longer service life. Farley et al. fails to disclose such durable spindle advantages since the device of Farley et al. transmits forces to the spindle 17. As such, the prior art as a whole fails to establish a prima facie case of obviousness. Claim 7 is not obvious in view of Takagi et al. and Farley et al. Accordingly, it is requested that the Examiner's rejection be reversed.

CLAIM 9

The references as a whole fail to teach or suggest the combination of a positive-locking connection that has pins and openings that engage each other at a carrying body of a bridge wherein the bridge relieves at least one spindle of forge forces and torque produced during friction welding. The final rejection takes the position that the capscrew connections 32, 35 of Farley et al. provide a positive lock connection of a carrying body to a headstock as featured in the present invention. However, the capscrew connections 32, 35 of Farley et al. do not provide a positive locking connection between a bridge and a headstock as claimed. Farley et al. fails to teach or suggest a bridge as featured in the present invention. The workpiece WP-1

of Farley et al. is supported at a backup plate 52 and acts on the actuator block 40, the chucking cylinder rod 51, the backup plate 52 and the actuator block 40 are pushed to the left by the upsetting force during friction welding. This transmits a force to the spindle 17 of Farley et al. and does not relieve the spindle 17 of a forge force as claimed. As such, the prior art as a whole fails to establish a prima facie case of obviousness. Claim 9 is not obvious in view of Takagi et al. and Farley et al. Accordingly, it is requested that the Examiner's rejection be reversed.

CLAIM 10

The references as a whole fail to teach or suggest at least one workpiece holder that is detachably connected to a spindle. The final rejection relies on claim 2 of Farley et al. to teach a removable chuck to permit employment of the chuck assembly with solid workpieces. This is improper. A reference must be used for what it teaches and suggests. Farley et al. merely discloses that outer chuck 36 may be used by itself for use with solid workpieces. However, Farley et al. fails to direct a person of ordinary skill in the art toward detaching the outer chuck 36 from the spindle 17 for use with solid workpieces. As such, the prior art as a whole fails to establish a prima facie case of obviousness as the prior art as a whole does not direct the person of ordinary skill in the art toward important features of the claimed combination. Claim 10 is not obvious in view of Takagi et al. and Farley et al. Accordingly, it is requested that the Examiner's rejection be reversed.

CLAIM 11

Takagi et al. and Farley et al. fail to teach or suggest a bridge that relieves at least one spindle of forge forces and torque produced during friction welding wherein the spindle and the bridge have similar workpiece holders. Takagi et al. fails to disclose a bridge as claimed and the device of Farley et al. clearly transmits forces to spindle 17 since the chuck body 31 is connected to the spindle nose 33 via drive key 34 . As such, the prior art as a whole fails to present a prima facie case of obviousness. Claim 11 is not obvious in view of Takagi et al. and Farley et al. Accordingly, it is requested that the Examiner's rejection be reversed.

CLAIM 13

The references as a whole fail to teach or suggest the combination of a feed drive mounted and supported at a column of a frame. The final rejection takes the position that the support plate 18 of Takagi et al. is the equivalent of a column of a frame as featured in the present invention. Appellant respectfully disagrees with this interpretation of Takagi et al. The reference must be given a fair reading for what it teaches and suggests. The support plate 18 is not a column of frame 2 of Takagi et al. The support plate 18 of Takagi et al. does not form a portion of frame 2 as claimed. As such, the prior art as a whole does not establish a prima facie case of obviousness since the prior art as a whole fails to teach or suggest each feature of the claimed combination. Claim 13 is not obvious in view of Takagi et al. and Farley et al. Accordingly, it is requested that the Examiner's rejection be reversed.

CLAIM 14

The references as a whole fail to teach or suggest the combination of a column of a frame and a stationary headstock connected by one or more tie rods. The final rejection takes the position that reference numeral 18 of Takagi et al. is the equivalent of a column of a frame of the present invention. Appellant respectfully disagrees with this interpretation of Takagi et al. The reference must be given a fair reading for what it teaches and suggests. Reference numeral 18 of Takagi et al. merely refers to a support plate. The support plate 18 is not a column of frame 2 of Takagi et al. as claimed since the support plate 18 is a completely separate element that does not form a portion of frame 2. As such, the prior art as a whole does not establish a prima facie case of obviousness since the prior art as a whole fails to teach or suggest each feature of the claimed combination. Claim 14 is not obvious in view of Takagi et al. and Farley et al. Accordingly, it is requested that the Examiner's rejection be reversed.

CLAIM 15

Takagi et al. and Farley et al. fail to teach or suggest a bridge that relieves at least one spindle of forge forces and torque produced during friction welding. The device of Farley et al. clearly transmits forces to spindle 17 since the chuck body 31 is connected to the spindle nose 33 via drive key 34 . Claim 15 is not obvious in view of Takagi et al. and Farley et al. Accordingly, it is requested that the Examiner's rejection be reversed.

CLAIM 16

Takagi et al. and Farley et al. fail to teach or suggest a bridge that relieves at least one spindle of forge forces and torque produced during friction welding. The device of Farley et al. clearly transmits forces to spindle 17 since the chuck body 31 is connected to the spindle nose 33 via drive key 34 . Claim 16 is not obvious in view of Takagi et al. and Farley et al. Accordingly, it is requested that the Examiner's rejection be reversed.

CLAIM 17

The references as a whole fail to teach or suggest the combination of at least one spindle drive having settable flywheel masses. The final rejection takes the position that reference numeral 24 of Takagi et al. is the equivalent of a settable flywheel mass as featured in the present invention. Appellant respectfully disagrees with this interpretation of Takagi et al. Reference numeral 24 of Takagi et al. merely refers to a second subordinate spindle 24 and does not refer to a flywheel as claimed. As such, the prior art as a whole fails to disclose a prima facie case of obviousness since the prior art as a whole fails to teach or suggest important features of the claimed combination. Claim 17 is not obvious in view of Takagi et al. and Farley et al. Accordingly, it is requested that the Examiner's rejection be reversed.

CLAIM 18

The cited prior art references as a whole fail to teach or suggest the combination including a stationary spindle drive having one or more additional flywheel masses that can be

coupled. The final rejection takes the position that reference numeral 24 of Takagi et al. is the equivalent of a settable flywheel mass as featured in the present invention. Appellant respectfully disagrees with this interpretation of Takagi et al. Reference numeral 24 of Takagi et al. merely refers to a second subordinate spindle 24 and does not refer to a flywheel as claimed. Even assuming reference numeral 24 of Takagi et al. did refer to a flywheel as featured in the present invention, Takagi et al. provides no suggestion or teaching for placing the flywheel on a stationary spindle as claimed. Takagi et al. only discloses that the second subordinate spindle 24 is provided on a movable headstock, but not on a stationary spindle as featured in the present invention. As such, the prior art as a whole takes a completely different approach and fails to establish a prima facie case of obviousness. Claim 18 is not obvious in view of Takagi et al. and Farley et al. Accordingly, it is requested that the Examiner's rejection be reversed.

CLAIM 19

The present invention relates to a process for operating a friction welding machine. Applicant has discovered the problem of spindles being subjected to extremely high forge forces and torque during conventional friction welding techniques. This drastically decreased the service life of the spindles. Applicant has solved this problem of the spindles receiving extremely intense forces by connecting a bridge to one of the headstocks such that at least one of the spindles is relieved of axial forge and welding forces and torque with the bridge during a welding operation. Applicant has discovered that the spindles last longer and are not subject

to failure since the bridge relieves the spindles from axial forge forces and torque. The prior art as a whole fails to disclose such features or such force relieving advantages.

Takagi et al. discloses a main driving motor 1 mounted on a bed 2 of a friction welding apparatus. A main platform 3 is mounted on the left hand side of the bed 2, while at the left hand side of platform 3, the first main spindle 4 is rotatably supported by bearing 5. Between a driven pulley 6 attached to the left end of the main spindle 4 and a driving pulley 7 of main driving motor 1, a belt 8 is connected. A second main spindle 9 is rotatably supported by bearing 10 at the right hand side of main platform 3 so as to be coaxial with first main spindle 4. A chucking member 12 for holding a first workpiece 11 is fixedly attached to the right hand end of the second main spindle 9. A subordinate platform 15 is mounted on a base 16 and is fixed on the right hand side of the bed 2 so as to be capable of axially moving back and forth along base 16. A secondary driving motor 19 and a transmission means 20 is directly connected to the secondary driving motor 19 and are placed on a support plate 18 which extends from the right hand end of the subordinate platform 15 along base 16. A chucking means 28 is provided for holding a second workpiece 27 which faces first workpiece 11.

Takagi et al. fails to teach or suggest the combination of a bridge connected to at least one headstock, wherein at least one spindle is relieved of axial forge and welding forces and torque with the bridge during a welding operation. At most, Takagi et al. discloses a chucking member 12 and a chucking means 28. However, neither the chucking member 12 nor the chucking means 28 of Takagi et al. has a bridge as claimed. In contrast to Takagi et al., at least one headstock is connected to a bridge. The bridge advantageously relieves one of the spindles

of the torque and the forging force that are generated during friction welding. This advantageously increases the service life of the spindle since the intense forces produced during friction welding are not constantly exerted on the spindle. Takagi et al. fails to disclose such torque and forging force reducing advantages since the chucking member 12 and the chucking means 28 do not have a bridge as featured in the claimed combination. As such, the prior art as a whole takes a different approach and fails to establish a prima facie case of obviousness.

Farley et al. also fails to teach or suggest the combination of a bridge connected to at least one headstock, wherein at least one spindle is relieved of axial forge and welding forces and torque with the bridge during a welding operation. Instead of being concerned with providing a structure that prevents forces and torque from being transmitted to a spindle, Farley et al. clearly discloses an arrangement of parts that transmits forces to spindle 17. According to Farley et al., workpiece WP-1 is held by an inner chuck 37 on the inside and by an outer chuck 36 on the outside such that the workpiece WP-1 is clamped between the inner chuck 37 and the outer chuck 36. The inner chuck 37 of Farley et al. is clamped by a mandrel 44 with the action of a chucking cylinder rod 51. However, the outer chuck 36 is additionally clamped during friction welding by the upsetting force introduced by the workpiece WP-1. Even though the workpiece WP-1 is supported at a backup plate 52 and acts on the actuator block 40, the chucking cylinder rod 51, the backup plate 52 and the actuator block 40 are pushed to the left by the upsetting force during friction welding. This disadvantageously transmits a force to the spindle 17 of Farley et al. and does not lead to a relief of the spindle 17 since the outer chuck

36 is supported via the keyway against the chuck body 31 so that upsetting forces act on the chuck body 31, which allows the forces to be transmitted to the spindle 17 since the chuck body 31 is fastened to the spindle 17. As such, a person of ordinary skill in the art would understand that the axial upsetting forces in Farley et al. would be transmitted to the spindle 17 since the chuck assembly 12 as a whole is fastened to the spindle 17 and has no other support such that the axial upsetting forces as well as the torques are absorbed by the spindle 17 and the spindle mount 18 only. As such, the prior art as a whole takes a different approach and fails to establish a prima facie case of obviousness as the prior art as a whole does not direct a person of ordinary skill in the art toward critical features of the present invention.

Takagi et al. and Farley et al. fail to provide any teaching or suggestion for a workpiece mount that is removed from a spindle, and a bridge with a workpiece mount attached thereto is placed over the spindle and connected to the headstock by means of a support. Neither Farley et al. nor Takagi et al. teaches removing a workpiece mount from a spindle and replacing it with a bridge that relieves the spindle of forces produced during friction welding. As already discussed above, Farley et al. disclose a bridge as claimed. As such, the prior art as a whole does not establish a prima facie case of obviousness. Claim 19 is not obvious in view of Takagi et al. and Farley et al. Accordingly, it is requested that the Examiner's rejection be reversed.

CLAIM 21

Claim 21 is directed toward a friction welding machine. The friction welding machine

includes a bridge. The bridge is a critical feature of the present invention because it prevents extremely intense forces, which are produced during frictional welding, from being exerted on the spindles. This significantly increases the service life 8, 9 and provides for a more reliable welding machine.

Farley et al. fails to teach and fails to suggest the combination of at least one workpiece holder having a bridge wherein the bridge relieves at least one spindle of a torque and a forge force during friction welding. The backup plate 52 and the actuator block 40 of Farley et al. do not absorb the torque and the upsetting force during friction welding such that the forces are transmitted to spindle 17. Farley et al. discloses a chuck assembly 12 that is connected to a spindle 17, which is driven, and a tailstock chuck 13 that is non-rotatable. Farley et al. clearly discloses an arrangement with only one spindle 17 wherein the spindle 17 would inevitably absorb the torques that occur during friction welding since there is no connection between the chuck assembly 12 and the housing of the friction welding machine 11 as shown in Figure 1. In fact, Column 2, lines 1-11 of Farley et al. disclose that the chuck assembly 12 has a chuck body 31, which is screwed to a spindle nose 33, and the spindle nose 33 is mounted on the spindle 17. As such, torque is transmitted to the spindle 17 of Farley et al. during welding by the chuck body 31 being connected to the spindle nose 33 via drive key 34. Compared with Farley et al., the bridge of at least one workpiece holder of the present invention receives torque that is produced during friction welding such that at least one spindle does not receive the torque created from the welding. This significantly increases the service life of the spindle and advantageously allows the workpiece holders to be rotated in opposite

directions so that the speed of rotation at the site of friction between the two workpieces is dramatically increased. Farley et al. fails to disclose such advantages since Farley et al. does not teach or suggest a structure that receives torque such that the torque is not transmitted to at least one spindle during friction welding as claimed. As such, the prior art as a whole takes a completely different approach and fails to teach or suggest important features of the claimed combination.

The references as a whole fail to provide any teaching or suggestion for the combination of a first headstock having a first spindle drive mounted thereto. The final rejection takes the position that reference numeral 13 of Takagi et al. is the equivalent of the first spindle drive of the present invention. Appellant respectfully disagrees with this interpretation of Takagi et al. Reference numeral 13 of Takagi et al. merely discloses a clutch means 13 disposed between a first main spindle 4 and a second main spindle 9. However, the clutch means 13 does not drive the spindle 4. The driving motor 1 of Takagi et al. would be the equivalent of a first spindle drive as featured in the present invention. However, the driving motor 1 of Takagi et al. is not mounted on a first headstock as claimed. As such, the prior art as a whole fails to present any basis to establish a prima facie case of obviousness since the prior art as a whole does not teach or suggest each and every feature of the claimed combination. Claim 21 is not obvious in view of Takagi et al. and Farley et al. Accordingly, it is requested that the Examiner's rejection be reversed.

CONCLUSION

Takagi et al. and Farley et al. fail to teach or suggest the crux of the invention. The invention presents a novel combination of features. The prior art fails to suggest similar ideas and fails to suggest the structural combination as claimed. Accordingly, it is requested that the Examiner's rejections be reversed.

ISSUE: Whether claim 12 is rejectable under 35 U.S.C. 103(a) as being unpatentable over Takagi et al. in view of Farley et al., and further in view of Deemie et al. (U.S. 3,439,853).

Takagi et al., Farley et al. and Deemie et al. fail to provide any teaching or suggestion for the combination including a bridge that relieves at least one spindle of forge forces and torque produced during friction welding. Farley et al. merely discloses a structure that transmits forces to spindle 17. The references as a whole provide no suggestion of using the teachings of Deemie et al. to modify the devices of Farley et al. and Takagi et al. A person of ordinary skill in the art would not look to the teachings of Deemie et al. as Takagi et al. already teaches a subordinate platform that is mounted on a base 16 fixed on a side of bed 2 so as to be capable of axially moving back and forth along base 16. As such, the prior art as a whole fails to establish a prima facie case of obviousness as the prior art references as a whole do not teach or suggest each feature of the claimed combination.

CONCLUSION

Takagi et al., Farley et al. and Deemie et al. fail to teach or suggest the crux of the invention. The invention presents a novel combination of features. The prior art fails to suggest similar ideas and fails to suggest the structural combination as claimed. Accordingly, it is requested that the Examiner's rejections be reversed.

Respectfully submitted
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SHOULD ANY OTHER FEE BE REQUIRED, THE PATENT AND TRADEMARK OFFICE IS HEREBY REQUESTED TO CHARGE SUCH FEE TO OUR DEPOSIT ACCOUNT 13-0410.

(8) CLAIMS APPENDIX

1. A friction welding machine comprising:

a frame;

a first headstock, which has a first spindle with a first workpiece holder and with a spindle drive;

a feed drive with a second workpiece holder;

a second headstock with a second spindle, with a spindle drive and with said second workpiece holder, wherein said second headstock is mounted axially movably at said frame and is connected to said feed drive, wherein at least one of said first workpiece holder and said second workpiece holder has a bridge, said bridge receiving a torque and a forge force during friction welding such that at least one of said first spindle and said second spindle does not receive the forge force and the torque produced via the friction welding, said bridge having a carrying body and a positive-locking support for connection to at least one of said first headstock and second headstock.

2. A friction welding machine in accordance with claim 1, wherein said first headstock is arranged stationarily at said frame.

3. A friction welding machine in accordance with claim 1, wherein said spindles have different sizes.

4. A friction welding machine in accordance with claim 3, wherein said spindle of said second spindle drive is smaller than said other spindle.

5. A friction welding machine in accordance with claim 1, wherein said second spindle drive is weaker than said first spindle drive.

7. A friction welding machine in accordance with claim 1, wherein a workpiece holder is mounted rigidly at said bridge.

9. A friction welding machine in accordance with claim 1, wherein said positive-locking connection has pins and openings that engage each other at said carrying body and said at least one of said first headstock and second headstock.

10. A friction welding machine in accordance with claim 1, wherein at least one said workpiece holder is detachably connected to a spindle.

11. A friction welding machine in accordance with claim 1, wherein said spindles and said bridge have said similar workpiece holders.

12. A friction welding machine in accordance with claim 1, wherein said second headstock has a traveling carriage, which is mounted and guided in a positive-locking manner

at a carriage guide at said frame along a direction of feed.

13. A friction welding machine in accordance with claim 1, wherein said feed drive is mounted and supported at a column of said frame.

14. A friction welding machine in accordance with claim 13, wherein said column and said stationary headstock are connected by one or more said tie rods.

15. A friction welding machine in accordance with claim 1, wherein said feed drive has one or more said cylinders.

16. A friction welding machine in accordance with claim 1, wherein said spindle drives have electric drive motors.

17. A friction welding machine in accordance with claim 1, wherein at least one said spindle drive has settable flywheel masses.

18. A friction welding machine in accordance with claim 1, wherein said stationary spindle drive has one or more additional flywheel masses that can be coupled.

19. A process for operating a friction welding machine, the process comprising:

providing the welding machine with a plurality of headstocks with spindles, spindle drives and workpiece mounts;

movably mounting one of said headstocks to provide a movably mounted headstock;

providing a feed drive for moving the movably mounted headstock, ; and

providing a bridge connected to one of said head headstocks, wherein one of said spindles is relieved of axial forge and welding forces and torque with the bridge during a welding operation, said workpiece mount being removed from said spindle that is to be relieved, and said bridge with a workpiece mount attached thereto is placed over said spindle and connected to said headstock by means of a support.

21. A friction welding machine comprising:

a frame;

a first headstock having a first spindle with a first workpiece holder and a first spindle drive, said first spindle drive being mounted on said first headstock;

a feed drive with a second workpiece holder, wherein a portion of said feed drive is in contact with said frame;

a second headstock having a second spindle drive mounted thereto and a second spindle, said feed drive extending through said second headstock such that second workpiece holder is located on one side of said second headstock, said second headstock being mounted for movement such that said second headstock is movable in an axial direction on said frame, wherein at least one of said first workpiece holder and said second workpiece holder has a

bridge connected thereto, said bridge receiving a torque and a forge force during friction welding such that at least one of said first spindle and said second spindle does not receive the forge force and the torque produced via the friction welding.

(9) Evidence appendix

NONE

(10) Related proceedings appendix

NONE